

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Re Application of: James Robert Allen, et al.  
Serial Number: 10/629,153 Art Unit: 3641  
Filed: July 29, 2003  
For: Environmentally Safe Substitute for Lead Shot

**Declaration in Support of A Petition To Make Special On the Grounds of  
Environmental Quality  
(37 C.F.R. 1.102(c) and 708.02 V MPEP)**

I, James Robert Allen, am a co-inventor of the invention disclosed in the patent application identified above and a co-inventor of the subject matter described and claimed therein. I am a Professional Mechanical Engineer (retired). I have been reloading and shooting shot shells for more than 50 years. I have observed first hand some of the effects of lead shot on ingestion by wildlife. Ingestion by wildlife of this invention will have no adverse effects. I have also observed the crippled and injured game from improper use of steel shot. I have been an active member of several conservation and sports groups that have purchased and restored millions of acres of wetlands in the U.S. and Canada. I have been an active bird hunter since 1951. I have observed first hand the dire need for a non-toxic shot the same weight and characteristics as lead. It is my contention and belief, based on my knowledge of the shooting sports and my expertise in shot shell reloading, that this invention will improve environmental quality because the use of traditional lead shot has been outlawed for waterfowl hunting in the U.S., Canada, UK and other countries.

As a result, much effort has been devoted to identifying a suitable substitute. To be fully satisfactory, among other things, any alternative shot should be a material that

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has a density similar to that of lead shot, the material must not cause physiological problems in wildlife that may ingest spent shot from the ground or water, the material must not cause significant damage to shotgun barrels, and for purposes of game law enforcement, shot material should preferably be magnetic to easily differentiate it from illegal lead shot. None of the alternative shot types currently available conforms to all of the above criteria. Current products in the USA include shot made of steel, bismuth/tin alloy, iron-tungsten alloy and tungsten-polymer composite.

Steel shot has problems of damaging gun barrels. Shot shell manufacturers have employed special powders to increase steel shot velocity, in an attempt to ameliorate its inferior ballistic properties. The "hotter" powders unfortunately create higher pressures within the gun barrel. Safety considerations have therefore prompted shot shell manufacturers to recommend that steel shells only be fired in certain types of modern, high-strength shotguns.

There is also a significant negative impact of steel shot on the very same wildlife, which the outlawing of lead is intended to preserve. The inferior ballistics of steel shot, in the hands of the public, has resulted in higher rates of "crippling" shots. This is because generations of hunters accustomed to shooting traditional lead shot tend to attempt to shoot waterfowl at the same distances that they have always considered to be "in range." Another approach taken by steel shot shell manufacturers has been to simply substitute larger steel shot for traditional lead shot sizes, in order to provide equivalent mass. This practice has the obvious disadvantage that there are fewer shot in any given shell. The "pattern density" of the cloud of shot is lower at any given

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distance from the point of firing. This sparse pattern again increases the probability that birds will be crippled, rather than harvested for consumption.

Bismuth alloy shot shells are currently marketed in the USA. Unfortunately, bismuth alloys are not equivalent to lead in density (about 9.4 g/cm.<sup>3</sup> vs. 11.0 g/cm.<sup>3</sup>), although somewhat more dense than steel (7.9 g/cm.<sup>3</sup>). In addition to this shortcoming, bismuth alloys are inherently brittle and therefore tend to fracture and disintegrate upon impact. As fracture surfaces form in the shot, energy is lost, which would otherwise be available to enhance penetration of the target. In this instance, it is even likely that all the increased energy gained by having higher density pellets than steel is lost as fracture occurs. Finally, it should be noted that bismuth is non-magnetic and cannot be readily distinguished from illegal lead shot by game officers in the field.

A more recent product, which began to be marketed in the USA in 1997. It is a shot shell containing binary iron-tungsten alloy shot (60%Fe-40%W, by weight). Because the Fe-W is very hard (about Rockwell C50), it must be ground with ceramic abrasives (alumina, silicon-carbide, diamond, etc.), particles of which become imbedded in the shot surface. As a result, this type of shot produces severe damage in all gun barrels unless the shot is encapsulated in a special "overlapping double-wall" plastic shot-cup of heavy construction. Even with this precautionary design, the manufacturer prints a clear message on each box of product disclaiming any responsibility for gun barrel damage or personal injury.

Other proposed shot materials include significant concentrations of lead as a specified ingredient. Recent rulings by the U.S. Fish and Wildlife Service have

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outlawed the use of any shot material containing more than 1.0% lead. This action has eliminated consideration of a variety of proposed materials.

As a result of these problems, shooters and reloaders have been forced to use inferior products to the original (now outlawed) lead shot. Moreover, hunter and shooters are no longer able to use their finest guns for fear of doing irreparable damage to their barrels.

My invention overcomes these problems. It consists of a shot pellet that, in one embodiment, has an inner core of tungsten carbide that is coated with a layer of soft Tin/Bismuth or similar non-toxic metals. This coating is molecularly bonded by die forming pressures to the tungsten carbide core and is **not an alloy**.

This then addresses the disadvantages of the shot addressed above, while maintaining all advantages of lead shot. The unique properties of the instant invention allow its density to be tailored. As explained below, the effective density of the instant invention can be made to be identical to lead for direct replacement in current lead loading formulations. Additionally, the density can be made to be lower than lead for older shotguns requiring low barrel pressures, or higher than lead for enhanced energy transfer while maintaining the other advantages of the instant invention.

This not only allows users to fire their old guns as if they were firing lead, it also eliminates the problems of pattern, mis hits, and other problems that plague the current alternatives. Thus, this invention will reduce the injury to animals and produce a cleaner environment.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine, imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Declarant's Signature: Date: 11/20/03

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